Improvement of Visualization of NASA A-Train Data in Google Earth™ & Virtual Globes Portal at NASA GES DISC

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NASA/GES DISC
Google Earth™ Portal
http://disc.gsfc.nasa.gov/googleearth/

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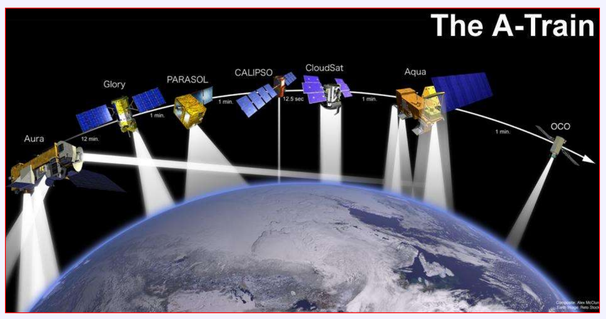
Overview and Improvement

Virtual Globes are increasingly becoming a popular three dimensional platform to change the way in which professionals are doing their research related to geo-referenced data. NASA Goddard Earth Science Data and Information Service Center (GES DISC) has done some work to visualize NASA two-dimensional (2D) mapped data and three-dimensional (3D) vertical data in Google Earth. The data can be gridded data or swath data from either satellites or campaign missions respectively. We not only visualized **gridded 2D and 3D data**, but also we re-projected **2D swath data (2D surface strips data)** and make them visualizable together with 3D vertical data in Google Earth. (Most of done work are in operation)

1. **The speed of producing KMZ files** is greatly improved. For a spatial range of about 3000 kilometers, Producing the KMZ file for one parameter of vertical data takes **only 8 seconds** while user clicks the "KMZ" button on Giovanni download interface after user visualized the data in web interface.
2. We **re-projected swath data and visualized them** in Google Earth **along with vertical data** for the same temporal and spatial range.

A-Train Vertical and Strips Data at NASA GES DISC

NASA Afternoon A-Train Satellite Constellation is a succession of seven US & international sun-synchronous orbit satellites, consisting of: --OCO (Orbiting Carbon Observatory) (launch failed on Feb. 24th, 2009); --Aqua; --CloudSat; --CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations); --PARASOL (Polarization and Anisotropy of Reflectances for Atmospheric Science coupled with Observations from a Lidar); -- Glory (will launch on Oct. 1st, 2010); and -- Aura. [Courtesy of NASA A-Train].



Gridded 2D Data:

TRMM (rain rate, etc.)
AIRS/Aqua (Cloud Liquid Water, water vapor burden, ozone burden, surface air temperature, surface skin temperature, etc.)
MODIS/Terra-Aqua (cloud fraction, cloud optical depth, cloud top pressure, cloud top temperature, aerosol optical depth, etc.)

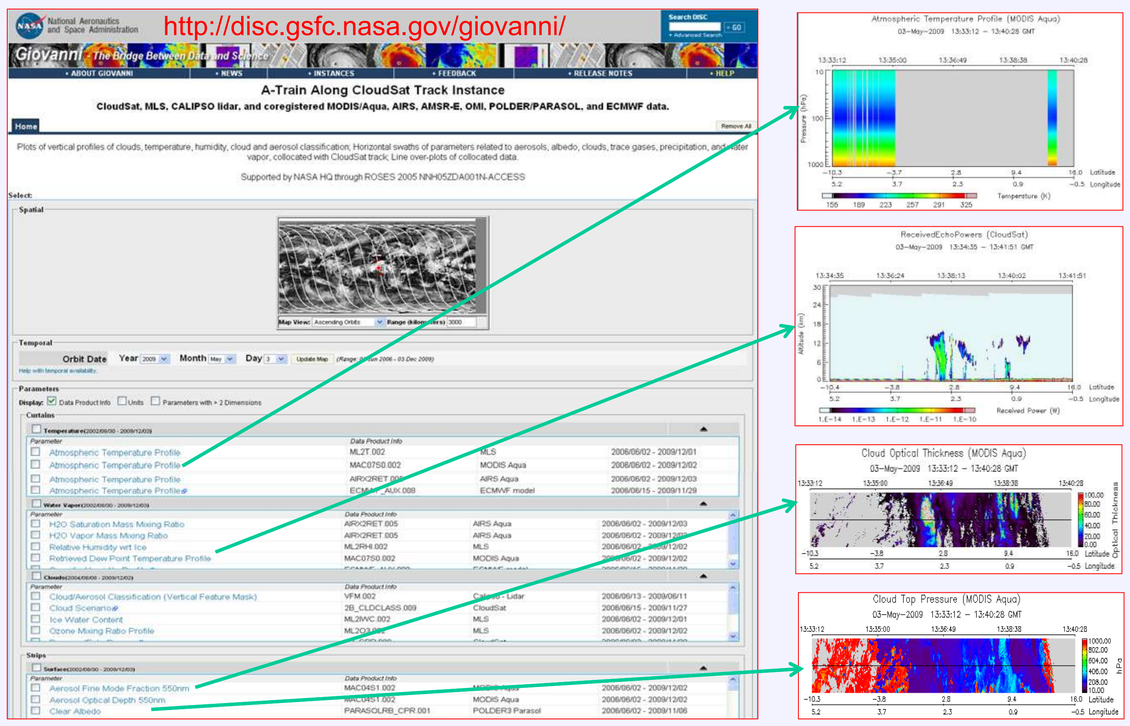
Gridded 3D Vertical Data:

CloudSat (cloud reflectivity, received echo powers, cloud scenario, RO ice water content, RO liquid water content)
CALIPSO (cloud/aerosol classification)
MODIS/Aqua (atmosphere temperature profile --ATP, etc.)
AIRS/Aqua (ATP, relative humidity water ice, ozone mixing ratio profile, etc.)
MLS (ATP, ice water content, zone mxing ratio profile, etc.)

2D Swath Data (Surface Strips):

MODIS/Aqua (aerosol optical depth 550nm, aerosol fine mode fraction 550nm, cloud optical thickness, cloud top pressure, etc.)
POLDER3/Parasol (cloud optical thickness, cloud pressure, cloud phase index, etc.)
AIRS/Aqua (cloud top pressure, cloud top temperature, total cloud liquid water, etc.)
OMI/Aura (effective cloud pressure for O3, final aerosol absorption optical depth 352nm, NO2 column amount, etc.)

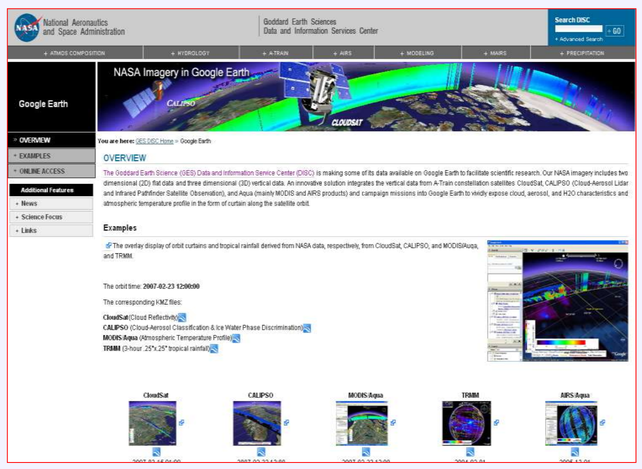
Giovanni A-Train Instance



Google Earth™ Portal at NASA GES DISC

A web portal describing Google Earth (GE) related scientific research and applications is running at GES DISC (**Right figure**). The whole procedures of visualizing data in GE are seamlessly integrated into several GES DISC's online systems which serve data and provide data analysis. Both **2D gridded and swath data and 3D vertical data products** and their online analysis results are enabled to be visualized in GE. The visualized data include all above mentioned data products. We also process and visualize some model data, e.g. **ECMWF model data.**

Some vertical data from campaign missions such as **CC-VEX, TC4, CLASIC**, are also processed and visualized in Google Earth.



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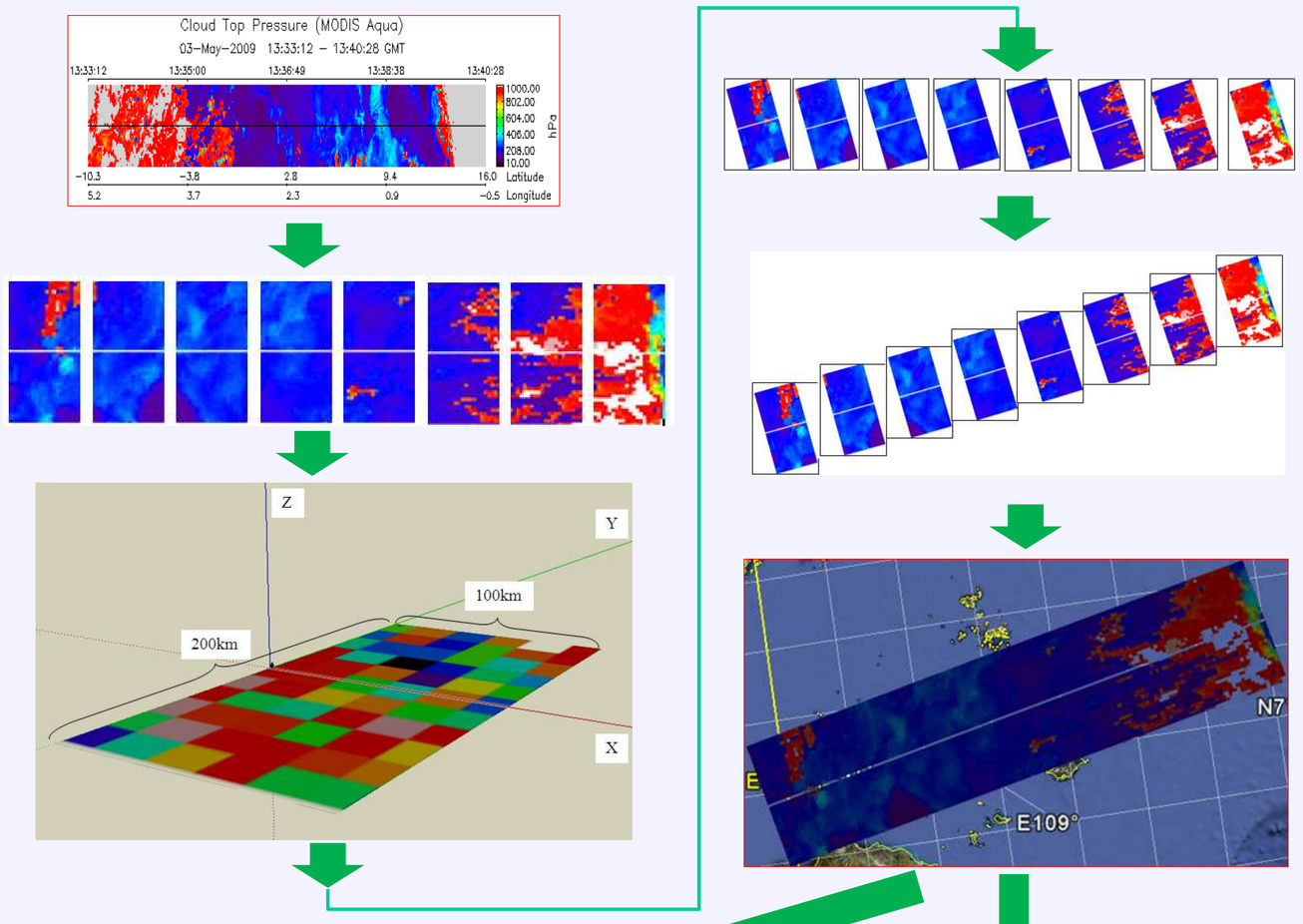
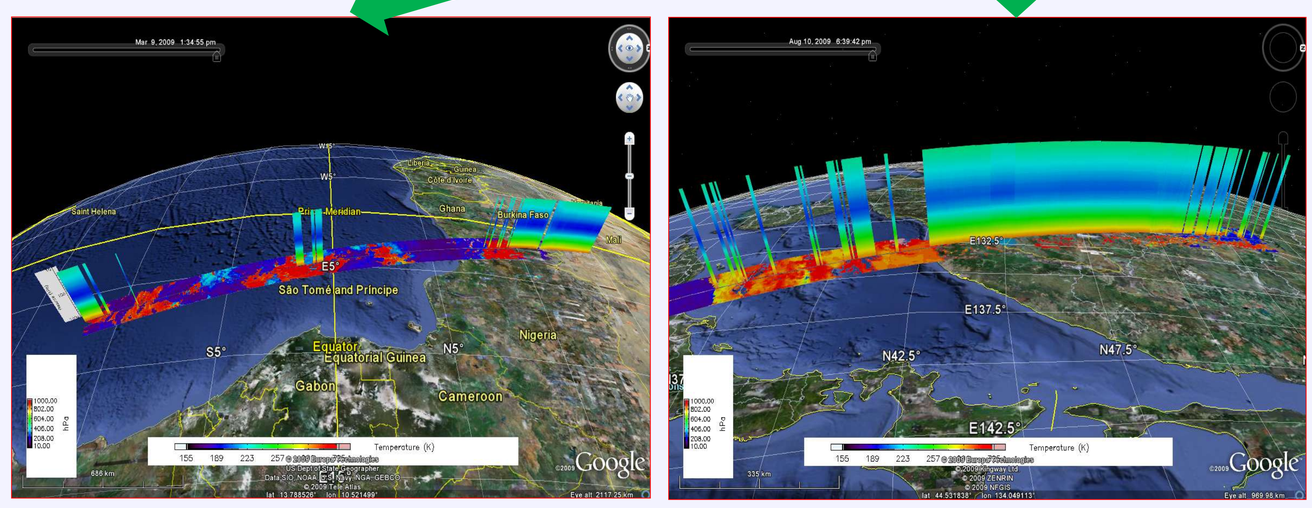
Many thanks come to Giovanni team for A-Train instance.

To Visualize Swath Data (Surface Strips) in Google Earth

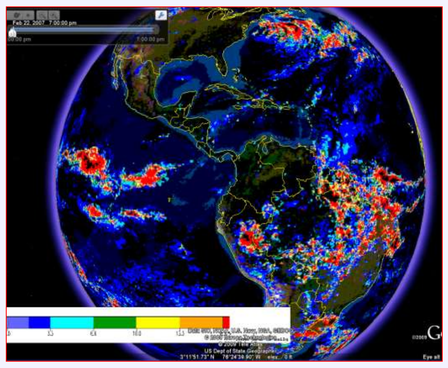




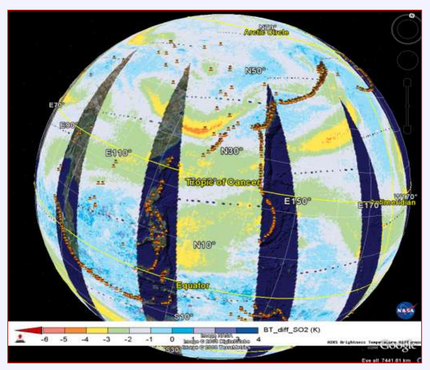
Left: Atmospheric Temperature Profile 3D vertical data from MODIS/Aqua and Cloud Top Pressure 2D surface strips from MODIS/Aqua on March 9, 2009

Other KMZ-available data products at GES DISC

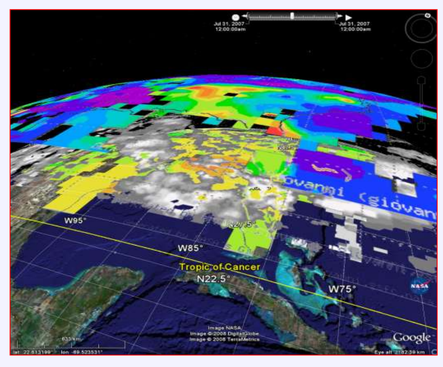
2D TRMM data (rainfall rate)



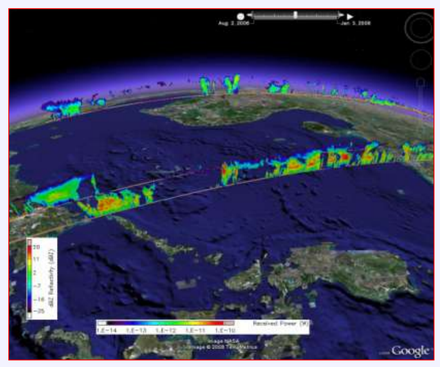
2D AIRS data (SO_2 & Volcanoes)



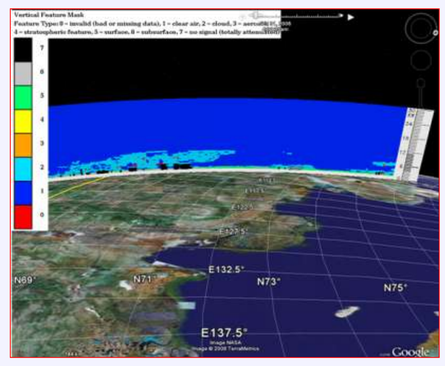
2D Air Quality (MODIS/Aqua)



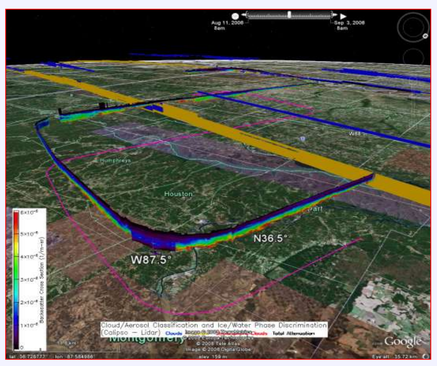
3D CloudSat data (radar reflectivity)



3D CALIPSO data (VFM)



3D data from Satellite and Campaign



Above Right Figure: GMT 5:48:00am – 5:55:00am 2006-08-02
Vertical curtain describing cloud vertical structure (Radar Reflectivity, dBZ) derived from CloudSat satellite, and daily rainfall (3B42) from TRMM satellite, and wind field from QuikSCAT satellite for **Typhoon Prapiroon**.

Conclusion

This research at GES DISC not only enable 2D and 3D gridded data from A-Train to be visualized together with other 2D geospatial data, but 2D swath data (surface strips) can be re-projected and visualized along with vertical profiles for the same temporal and spatial range to compare these different kinds of products to discover scientific issues in a virtual environment. This ability to visualize and compare diverse data derived from remote sensors provides researchers with a novel and valuable tool for scientific data exploration.